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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
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| 09/508,322 | 03/09/00 | HOLME | 22815138 |

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| ART UNIT 1742 | PAPER NUMBER |
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DATE MAILED:

07/20/01 *8*

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/508,322

Applicant(s)

HOLME, JOHN DAVID

Examiner

Harry D Wilkins, III

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 June 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4,7 and 8 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4,7 and 8 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-4, 7 and 8 are pending. Claim 1 has been amended and claims 5 and 6 have been cancelled.
2. The rejections under 35 U.S.C. 102 based on the Akiyama et al, EWA and Lawrence et al references have been withdrawn.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-4, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lawrence et al (US 5,948,353) in view of Applicant's admission of prior art and further in view of Madsen (GB 737,510).

Lawrence et al teach a disc brake rotor made of gray cast iron. Lawrence et al teach (see col 1 line 57 to col 2 line 5) that the composition contains 0.5 to 1.0 wt% copper and contains "carbide forming metals" including titanium and vanadium.

Lawrence et al teach a broad range of less than 1 wt% of vanadium, however, it would have been within the expected skill of a routineer in the art to have optimized the content of vanadium to between 0.35 and 0.45 wt%, which is within the specified range of Lawrence et al, in order to maximize hardness and wear resistance. Lawrence et al teach a broad range of less than 1 wt% of titanium.

Applicant admits as prior art (see page 3, second paragraph) that it was well known in the art at the time of the invention that titanium contents below 0.1 wt% promoted graphitization and form hard particles of titanium carbonitride. Also known was that when the titanium content was above 0.05 wt% that cast irons became difficult to machine.

Therefore, it would have been obvious to keep the titanium content of the cast iron of Lawrence et al to a level below 0.05 wt% in order to reduce difficulty in machining because it was well known in the art to do so as admitted as prior art by Applicant. It would have been within the expected skill of a routineer in the art to have optimized the content of titanium in the range of less than 0.05 wt% to create a cast iron with maximum hardness and wear resistance.

Lawrence et al do not teach or suggest that the content of copper should be related to the content of hard carbide forming elements, such as titanium and vanadium.

Madsen teaches (see line 66) that the copper content of a cast iron can be limited by the amount of carbide forming elements, such as vanadium, present in the alloy.

Therefore, it would have been within the expected skill of a routineer in the art to have optimized the ratio of copper to the carbide forming elements, as disclosed by Madsen, in order to optimize the hardness and wear resistance of the cast iron of Lawrence et al.

Regarding claim 2, Lawrence et al teach that the composition also includes chromium at 0.2 to 0.5 wt%.

Regarding claim 3, it would have been within the expected skill of a routineer in the art to have limited the vanadium to an amount less than half the content of copper plus twenty times the content of titanium because once the ratio of copper to carbide forming elements had been established, the content of vanadium would have been above one half of the copper content.

Regarding claim 4, Lawrence et al teach that the composition includes more than 3.40 wt% carbon, 1.0 to 2.5 wt% silicon and less than 0.15 wt% phosphorous which means that the carbon equivalents have a minimum of 3.733 which overlaps the claimed range.

Regarding claim 7, Lawrence et al teach that copper can be included in the range of 0.7 to 0.9 wt%. Therefore, it would have been within the expected skill of a routineer in the art to have optimized the content of copper in order to maximize the hardness and wear resistance.

Regarding claim 8, it would have been within the expected skill of a routineer in the art to have limited the vanadium to an amount less than half the content of copper plus twenty times the content of titanium because once the ratio of copper to carbide forming elements had been established, the content of vanadium would have been above one half of the copper content.

The effective filing date of Lawrence et al is based upon the provisional application which contains all of the specifications relied upon in this rejection.

5. Claims 1, 3, 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Madsen (GB 737,510) in view of Akiyama et al (JP 02138438 A) or Lawrence et al (US 5,948,353) and further in view of Applicant's admission of prior art.

Madsen teaches a gray cast iron for use in piston rings in internal combustion engines. The composition includes (see line 59 to line 72) vanadium in an amount between 0.15 to 0.45 wt%, with copper being present at 3 to 5 times the amount of vanadium and titanium in an amount that is 1/6 to 1/2 the amount of vanadium.

Madsen teaches a range of vanadium that overlaps the presently claimed range. However, it would have been within the expected skill of a routineer in the art to have optimized the content of vanadium within the specified range of Madsen in order to maximize hardness and wear resistance.

Madsen does not teach that the gray cast iron can be used for a disc brake rotor, nor that when the vanadium content is within the presently claimed range that the content of titanium is between 0.025 and 0.035 wt%.

Akiyama et al teach (see title and abstract) a similar gray cast iron composition that is used to create rotors for disc brakes. Lawrence et al teach (see title and abstract) a similar gray cast iron composition that is used to create rotors for disc brakes.

Therefore, it would have been obvious to one of ordinary skill in the art to use the cast iron of Madsen for making a disc brake rotor because it has a low wearing characteristic and increased strength values (see page 2, lines 5-10) which are

desirable for use in a disc brake rotor and because it is well known in the art to use gray cast irons for disc brake rotors as evidenced by Akiyama et al or Lawrence et al.

Applicant admits as prior art (see page 3, second paragraph) that it was well known in the art at the time of the invention that titanium contents below 0.1 wt% promoted graphitization and form hard particles of titanium carbonitride. Also known was that when the titanium content was above 0.05 wt% that cast irons became difficult to machine.

Therefore, it would have been obvious to keep the titanium content of the cast iron of Madsen to a level below 0.05 wt% in order to reduce difficulty in machining because it was well known in the art to do so as admitted as prior art by Applicant. It would have been within the expected skill of a routineer in the art to have optimized the content of titanium in the range of less than 0.05 wt% to create a cast iron with maximum hardness and wear resistance.

With the thus optimized composition of Madsen in view of Applicant's admission, given range of the hard carbide forming elements (0.35 wt% V, 0.035 wt% Ti) the content of copper, based on Madsen's formula of 3 parts copper per 1 part carbide former, would have been 1.155 wt%, which is within the presently claimed region.

Regarding claim 3, Madsen teaches that vanadium must be present at less than half the amount of copper because the copper content must be at least three times the amount of the vanadium.

Regarding claim 4, Madsen teaches that carbon is contained at an amount between 2.5 to 3.9 wt%, 0.8 to 3.0 wt% silicon and 0.025 to 0.1 wt% phosphorous which

means that the carbon equivalents are 2.7917 to 5.0000 which overlap the claimed range.

Regarding claim 7, Madsen teaches that copper can be contained at 0.7 to 0.9 wt%.

Response to Arguments

6. Applicant's arguments filed 11 June 2001 have been fully considered but they are not persuasive. The arguments with respect to the rejections based on the Akiyama et al and EWA references have been considered and the rejections were withdrawn.

Applicant has argued that:

- a. the composition of Lawrence et al teaches a minimum content of copper based on the content of the carbide forming elements is outside the claimed range;
- b. the combination of Madsen with Akiyama et al or Lawrence et al was improper because of the differences between disc brake rotors, as in the present invention, Akiyama and Lawrence, and piston rings, as in Madsen; and,
- c. the composition of Madsen teaches a minimum copper content based on the content of the carbide forming elements is outside the claimed range.

In response to a, in view of Applicant's admission of prior art, one of ordinary skill in the art would have been led to reduce the content of titanium to a value within the claimed range. In addition, given the content of carbide forming elements of Lawrence et al of 0.2 wt% chromium (the only required carbide forming element) plus the 0.375 wt% of titanium and vanadium as claimed, would yield a minimum content of 1.035 wt% (0.575×1.8).

In response to b, alloy properties are inherently a function of the composition and each alloy has a set of properties which make is useful for a certain set of applications. Given the similarity of composition between Madsen and either Akiyama et al or Lawrence et al one of ordinary skill in the art would have expected a reasonable chance of using the cast iron of Madsen to make a disc brake rotor. In addition, the cast iron of Madsen provides improved wear resistance and hardness that are desirable properties for disc brake rotors.

In response to c, in view of Applicant's admission of prior art, one of ordinary skill in the art would have been led to reduce the content of titanium to a value within the claimed range. In addition, given the content of carbide forming elements of Madsen of 0.375 wt% titanium and vanadium as claimed, would yield a minimum content of 1.125 wt% (0.375×3.0).

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-F 8:15am-4:45pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3599 for regular communications and 703-305-3599 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw
July 18, 2001


ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700